(No Model.) 2 Sheets—Sheet 1.

W. SCOTT.

OSCILLATING CYLINDER PRINTING PRESS.

No. 456,741. Patented July 28, 1891.

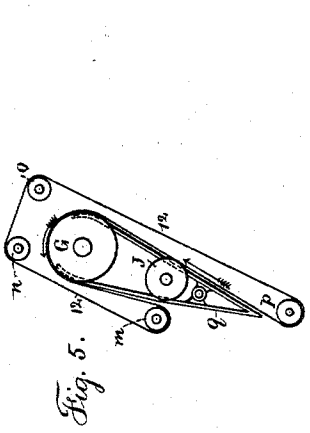


Fig. 5.

Fig. 1.

Fig. 4.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

W. SCOTT.

OSCILLATING CYLINDER PRINTING PRESS.

No. 456,741. Patented July 28, 1891.

Fig. 2.

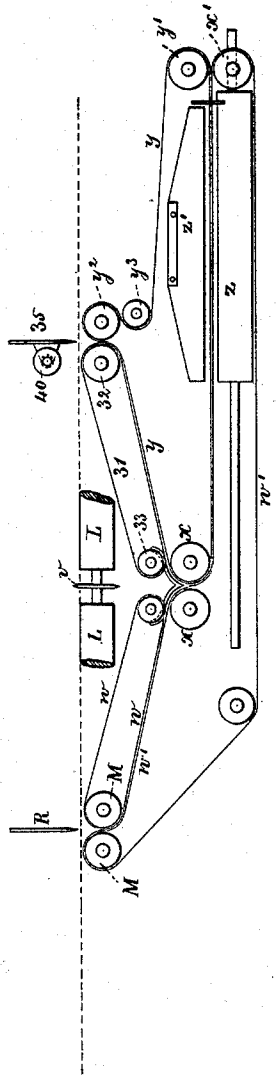
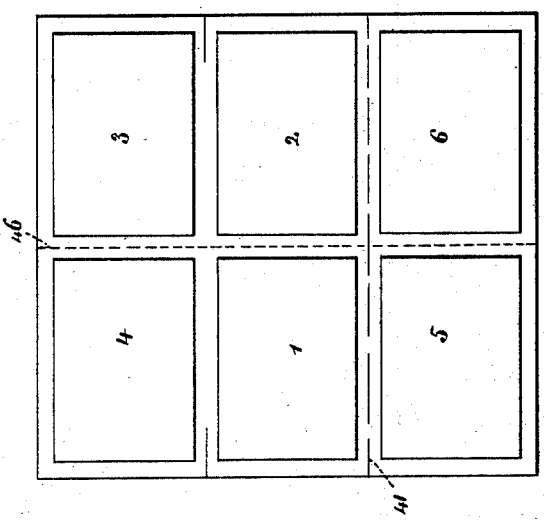


Fig. 3.



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UNITED STATES PATENT OFFICE.

WALTER SCOTT, OF PLAINFIELD, NEW JERSEY.

OSCILLATING-CYLINDER PRINTING-PRESS.

SPECIFICATION forming part of Letters Patent No. 456,741, dated July 28, 1891.

Application filed July 23, 1890. Serial No. 359,624. (No model.)

To all whom it may concern:

Be it known that I, WALTER SCOTT, a citizen of the United States, residing at Plainfield, in the county of Union and State of New Jersey, have invented an Improvement in Oscillating-Cylinder Printing-Presses, of which the following is a specification.

In this press the impression-cylinder is oscillated by racks upon the bed and acting upon gear-wheels at the ends of the impression-cylinder. The bed itself is moved backward and forward by any suitable device—such as a crank and rolling gear-wheel—and the paper is fed into the press either from a roll and between revolving cutters that separate the web into sheets, or the paper may be fed by hand from the feed-board. In either case the sheet is taken by the first set of grippers upon the oscillating impression-cylinder, and it is carried through the press and receives one impression, and the advancing end of the printed sheet is thrown off and carried up by belts around the reversing-cylinder and brought down again into position and taken by the second set of grippers upon the impression-cylinder, so as to be reversed and carried through the press and printed on the other side, and the printed sheet is taken from the impression-cylinder by the grippers of the delivery-cylinder and carried to a folding mechanism. As the web of paper passes into the press the cutting-cylinder perforates each sheet in the middle of its length in addition to separating one sheet from the other, and after the printing operation has been performed and the sheet is being delivered a breaking-cylinder is made to act upon the advancing sheet to separate the first sheet from the second at the line of perforation, and the first sheet is carried on and delivered beneath the folder, and in order to give time for the folding of the first sheet the second sheet is carried up by belts and over the folding device and brought back in the opposite direction beneath the folder, thereby obtaining the time necessary between one folding operation and the next and at the same time presenting the two printed sheets in the proper position so that when folded the pages will be in the proper order with the titles out.

In the drawings, Figure 1 is a diagrammatic sectional elevation illustrating the positions of the respective parts. Fig. 2 is a diagrammatic elevation of the folding mechanism. Fig. 3 indicates the manner of managing the forms and cutting and folding the sheet. Fig. 4 is a plan of the connecting-gearing, and Fig. 5 is a detached view of a modification of the belts for the reversing-cylinder.

The bed A is reciprocated by suitable mechanism, and upon it are the forms or types for printing, and I have represented inking-rollers at C. These parts are to be of any desired character; but the impression-cylinder B is provided with two sets of grippers 7 and 8 and throw-off fingers 9 adjacent to the first set of grippers 7, and these grippers and throw-off fingers are to be operated by any suitable cams, as usual in printing-presses.

The paper may be fed to the impression-cylinder B by hand, the sheets being laid on a feed-board D, in which case the sets of tapes or belts and the rollers for the same that are employed for feeding in the paper automatically will be temporarily removed. I have shown such sets of belts or tapes 10 and 11 as passing around the rollers *a*, *b*, *c*, and *d*, and there is a roller at *e* for causing the belts to nip the paper sufficiently for forwarding the sheets, and the tapes diverge as they approach the impression-cylinder sufficiently to allow the sheets to be drawn along at the speed of the impression-cylinder. I have represented feed-rollers E and cutting-cylinders F F′, between which the paper from the roll is passed, and there are bridge-bars *f* to pass the paper from the cylinder F in between the sets of belts 10 and 11, and bridge-bars *g h* at the other end of the sets of tapes 10 and 11 to direct the advancing end of the sheet to the first set of grippers 7 upon the impression-cylinder B. The cutter *i* acts in connection with the groove *i′* to entirely separate the web of paper into sheets, and the perforator *k* acts in connection with the groove *l* to perforate the sheets transversely and in the middle, the perforation not being sufficient to cause the sheets to tear apart during the printing operation; but they are sufficient to allow the sheets to be pulled apart after printing. The first set of grippers 7 seize the sheet and carry it through while the bed A is reciprocating in

one direction, and the printed sheet is carried up by these grippers 7 to the set of tapes or belts 12, that pass around the rollers *m n o p* and also around the reversing-cylinder G, and there are V-shaped guide-bars *q* adjacent to the tapes or belts 12 and to the impression-cylinder B, their rear ends passing in between the disks or pulleys forming the roller J for the set of belts or tapes 13, that pass around such roller J and around the reversing-cylinder G. Hence after the first impression has been given and the grippers 7 have passed above the roller *p* the fingers 9 throw off the advancing end of the sheet against the sets of tapes or belts 12 and beneath the guide-bars *q*, and such sheet is carried by the tapes 12 to the roller J, and by the sets of tapes or belts 12 and 13 up around the reversing-cylinder G and down at the opposite side of the roller J and of the guide-bars *q*, and the second set of grippers 8 upon the impression-cylinder B receive such advancing end of the sheet, and the sheet is carried by such grippers during the second impression upon such sheet. During this second impression the cylinder B is oscillating in the opposite direction, and the grippers 8 carry the advancing end of the sheet up to the delivery-cylinder H, where such sheet is received by the grippers 14 and carried up over such delivery-cylinder and by the sets of tapes or belts 15 around the same to the roller *s*, and in this movement it is preferable to employ guide-bars 16 above the sets of belts 15 and to cause the paper to move along with regularity by the feeding and holding cylinder I, that is in contact with the delivery-cylinder H, the paper being nipped between them.

I have represented the delivery-cylinder H and feeding-cylinder I as geared together and as connected by the train of gearing 17 18 with a gear-wheel upon the shaft of the reversing-cylinder G, so that these cylinders all rotate together and in the directions indicated by the arrows, and I remark that these cylinders and gears may receive their motion from any desired part of the press; but it is preferable to give motion to the delivery-cylinder H and feeding-cylinder I by loose gearing and pawl connections, there being a loose gear on the shaft of each cylinder I and H gearing with a wheel on the oscillating cylinder B and a pawl connection therefrom to the cylinders themselves in opposite directions on the respective cylinders, and the cylinders H and I are also geared together. Hence one pawl will move the cylinders in the directions of the arrows as the impression-cylinder B oscillates in one direction, and the other pawl will continue the motion in the other direction as the cylinder B oscillates in the other direction; but as any suitable means may be used for this purpose further description is not necessary, and such a device is shown in my application, Serial No. 359,623, filed July 23, 1890, such construction being in order that the surfaces of the respective cylinders G H I may be moved at the same speed as the surface of the impression-cylinder B, but intermittently in one direction instead of being oscillating.

The distance between the delivery-cylinder H and the breaking-roll K is greater than the distance between the line of perforations made by the perforators *k* and the end of the sheet, in order that the second half of the sheet may remain between the delivery-cylinder H and the holding-cylinder I, while the first half of the sheet is drawn away by the breaking-cylinder K and the roller L and passed at an accelerated speed into the folding mechanism next described. It is preferable to employ cushions or strips that act on the margins of the sheets during the breaking operations, so as not to smear the printing.

There are four sets of tapes and belts employed in the folding mechanism and numbered, respectively, 20, 21, 22, and 23. The first set 20 passes around the roller L and the roller L′ at the distant end beyond the folding-rollers M. The second set of belts 21 passes around the rollers N N′ and beneath the rollers O O′. The third set of tapes or belts 22 passes around the rollers O O^2 and beneath the roller O′ and above the roller N′, and the fourth set of tapes or belts 23 passes around the breaking-cylinder K, over the tightening-roller P, around the roller N, and over the rollers O O^2, and there is a switch Q adjacent to the breaking-cylinder K, to which a motion is given by suitable devices at the proper time, so that when it is raised the first sheet passes in below the switch and upon the belts 20 and along beneath the roller N′ and between the belts 20 and 21, above the folding-rollers M and beneath the folding-blade R, and the advancing end of the sheet is stopped by a fence or gage S, and the folding-blade R is made use of to carry the center of the sheet down between the rollers M to fold such sheet in the usual manner. When the point of the switch Q is depressed beneath the advancing end of the second sheet as it passes between the breaking-cylinder K and the roller L, such sheet is carried up over the roller O^2 and between the sets of belts 22 and 23, and such sheet is carried along and over the roller O and down beneath the same and between the set of belts 21 and 22, along beneath the folding-blade R, and in the opposite direction to the first sheet, and the advancing end is stopped against the fence or gage T, after which the folding-blade R is depressed to fold this second sheet, and it is to be understood that the distance traveled by the first and second respective half-sheets is such that the first half-sheet will be folded during the reciprocation of the bed B in one direction and the second half-sheet will be folded during the reciprocation of the bed in the opposite direction, or nearly so.

It will be understood that the term "sheet" as hereinbefore used has been applied to the paper cut off from the web by the cutter *i*, and that the perforators *k* act in the middle of the sheet at the line 46, Fig. 3, so that when the two parts are pulled apart, as before mentioned, they become the two halves of the sheet; but each of these halves is a complete product in itself and the one is a duplicate of the other, because in running through the press the sheet has been reversed to bring the pages in the proper position for producing two similar products.

It is preferable to mount the rollers *p* upon arms 24 upon a rock-shaft having an arm 25 and connecting-rod 26, with a spring 27 tending to press the roller *p* toward the impression-cylinder B, and the cam 28 is made use of for swinging the roller *p* away from contact with the impression-cylinder B, the object of this arrangement being to run the printed sheet after receiving the first impression off from the impression-cylinder by the contact with the sheet of said roller *p* and the belts passing around the same and insure the delivery of the sheet upwardly to the reversing-cylinder G, and by drawing back the roller *p* the sheet is free to descend as it is drawn down by the second set of grippers and receives the second impression.

The mechanism for rotating the respective cylinders and belts may be of any desired character. I have represented beveled gearing for driving the breaking-cylinder, and the speed of this and of the sets of belts or tapes that are moved by it is sufficiently accelerated for drawing the first half of the sheet and separating the same from the second half of the sheet and on the line 46 of the perforations, as aforesaid, and the folding-blade R is to receive its motion at the proper time by any suitable mechanism.

It will be apparent that the fences or gages S T require to be raised and lowered alternately in order that the sheet may be run in from opposite directions. I have shown cams 29 and 30 upon the shaft *t*, acting upon connecting-rods *u u'*, that extend to crank-arms upon cross-shafts to which the respective frames and gages are connected, and the cams 29 and 30 are to be shaped in such a manner as to raise the gage S when the second sheet is passing in to be folded and to raise the gage T when the first sheet is passing in beneath the blade to be folded.

Usually this press is constructed with reference to printing, four, six, or eight pages, and for printing eight pages a double width of web is required, and for six pages a width of web is required that is half as wide again as the web made use of in printing four pages, and having reference to Fig. 2 I remark that the devices heretofore described are not in any respect changed when printing four, six, or eight page sheets, and the forms are to be arranged as indicated in Fig. 3 for four and six pages. If a double-width web is used, I am enabled to print four products at the same time—that is to say, a sheet that is long enough to be separated in the middle of its length into two half-sheet products and is also wide enough to be separated longitudinally can be used to make four products. If the types or plates are duplicated upon the type-bed, they may be arranged in such a way as to print four similar products of four pages each, each product being composed of one-quarter of the sheet, such sheet being separated transversely in the center of its length and also slit longitudinally; or, in case a six-page product is required, the web being one and one-half width instead of a double width, the web is slit longitudinally at one-third of the distance from one edge on the line 41, so that two pages are produced thereby, and the other four pages are printed upon the single width and folded in the middle, and the products are brought together, it being understood that the line of perforation in the whole-length sheet is employed as before described, so that there are two similar products of six pages each produced, each complete movement of the press. In case the forms are properly placed on the bed and a double-width web is used, there may be printed two products of eight pages each, and the sheets may be associated in the folding, as next described. In order to carry out these features and adapt this press to the conditions before described, I employ a rotary slitter *v* for separating the paper longitudinally of the web and on the line 41. This slitter acts, however, upon the paper after it has received the second impression, and preferably this slitter is located adjacent to the breaking-cylinder K, so that the paper is passed beneath such breaking-cylinder K after it has been slit longitudinally, and the two portions of the sheet as separated and carried along by the belts, as aforesaid, and brought in beneath the folding-blade R from either one direction or the other direction and folded downwardly between the folding-rollers M, and around these folding-rolls are sets of tapes or belts *w* and *w'*, that convey the folded product to the second set of rolls *x*, and the belts *w'* also pass around the roller *x'*, and there is a set of tapes or belts *y* passing around the rollers *y'*, y^2, y^3, and *x*. The belts between the rollers *x* and *y'*, being parallel with each other, convey the sheets after receiving the first fold to the roll *z* and beneath the folding-blade *z'*, that applies the second fold to the product of the press, and the belts or tapes 31, that pass around the rolls 32 and 33, are contiguous to the belts *y* as they pass from the roll y^2 to the roll *x*, so that the rolls 32 and y^2 are adapted to folding that portion of the web or sheet that is cut off by the rotary slitter *v*. This slitter may be placed in any desired position. I prefer to place it upon the axis of the roll L and in the center of the press. If the portion separated is the same width, the line of slit being central of the

sheet, the folder 35 will act between the rolls y^2 and 32 to fold this half of the product longitudinally, and this portion of the product (which is folded by the blade 35) will reach the portion of the product that is folded by the blade R at the rolls x and pass through between them, the folded edges of the two sheets coming together and corresponding in position, and to facilitate this movement V-shaped bars are applied above the roll x x to direct the folded edges down between such rolls x x. If, however, the product of the press is not double width and one edge thereof only extends to the blade 35, then it is necessary to make use of a drop-roller 40 upon the inner side of this blade 35, so that as the blade carries the edge of the sheet down between the rolls y^2 and 32 the drop-roller 40, coming into contact with such sheet and pressing it against the belts that pass around the roll 32, will impart to the sheet the necessary movement to carry the edge down between such rolls 32 and y^2 and cause the advancing edge of the sheet to meet the folded edge of the product that is folded by the blade R. By this construction I am enabled to adapt this printing and folding device to products having four, six, or eight pages, it being understood that when only a four-page product is printed on the press the blade R alone is employed in making the first fold, and under all circumstances the second folding-blade z' and rolls z may or may not be brought into action, according to the number of folds that are to be given to the product of the press.

In consequence of the type-bed reciprocating and the impression-cylinder turning first one way and then the other, it is important to prevent the inertia of any of the other cylinders that receive the sheet from the impression-cylinder moving the belts or the printed sheet too far as the oscillating impression-cylinder stops. It is therefore advantageous to make use of suitable brake or similar device with either or the sheet-receiving cylinders to check the inertia and prevent the parts turning on as the bed and impression-cylinder slow up. I have shown a brake 48 for the cylinder I, the same being brought into action at the proper time by a cam 49.

In Fig. 5 I have shown the bars q as extended to the reversing-cylinder G, so as to dispense with the belts 13. In this case the belts 12 will run against the roll J, so as to move the sheet along to the reversing-cylinder G.

I remark that I do not limit the sheet-delivery mechanism herein shown to use with any particular reversing-cylinder, as the reversing mechanism may be similar to that shown in my application, Serial No. 359,623, filed July 23, 1890.

If the cylinders H I are provided with male and female cutters, the perforators k may be dispensed with, the parts otherwise remaining unchanged.

The V-shaped guide-bars q allow the sheet as it is passed away from the impression-cylinder at one side of them to be reversed and returned to the cylinder on the other side of the bars and at the same or nearly the same place. Thereby the grippers seize the sheet to the best advantage, and but little space around the cylinder is occupied by the reversing devices.

This press has great capacity, because the same is adapted to different lengths of sheet, whether fed by hand or otherwise, because the advancing end of the sheet is always gripped irrespective of the length the sheet may extend behind the grippers. Hence the positions of the grippers do not require to be varied. The type-forms, however, require to be properly placed on the bed.

I claim as my invention—

1. The combination, in a printing-press, of feeding devices and cutters adapted to separate sheets of the proper length from a web and perforators for perforating the sheets transversely in the middle, a reciprocating type-bed adapted to receive forms for printing both sides of the sheet, an impression-cylinder receiving its motion from the reciprocating bed, a sheet-reversing mechanism adapted to turn the sheet and present the same in the opposite direction to the action of the type upon the return movement, sheet-delivery mechanism adapted to hold the second part of the sheet as delivered, and a breaker to separate the first part of the sheet from the second at the line of perforation, substantially as set forth.

2. The combination, in a printing-press, of a feeding mechanism for supplying the sheets, a perforating device for perforating the sheets transversely, a printing mechanism for printing the sheets upon both sides, and an accelerating mechanism for separating the printed sheet into two parts upon the line of perforation and delivering the parts separately, substantially as set forth.

3. The combination, with the reciprocating type-bed and the oscillating impression-cylinder, of two sets of grippers acting in opposite directions, fingers to throw off the sheet as released from the first set of grippers, and a sheet receiving and reversing mechanism for turning the sheet and presenting the advancing end to the second set of grippers, substantially as set forth.

4. The combination, with the type-bed and impression-cylinder, of a sheet-delivery cylinder and a forwarding and holding cylinder between which the separate printed sheets pass, conveying-belts, a breaking-cylinder having an accelerated movement for separating the first half of the product at the line of perforation from the second half of the product, folding-rollers, and a blade for folding the respective products successively and separately, substantially as set forth.

5. The combination, with a press for printing on separate sheets, of the sheet-delivery mechanism, a cylinder for separating the

printed sheet into two products, a folding apparatus, and sets of belts, substantially as specified, for conveying the two halves of the product to the folding mechanism, one set of belts carrying the sheet directly in one direction to the folder and the other carrying the sheet past the folding mechanism and introducing the same beneath the folding-blade from the opposite direction, the folding-blade acting successively and separately on the two halves of the product, substantially as set forth.

6. The combination, with a printing mechanism for printing on opposite sides of a sheet, and perforating devices for perforating the sheet, of sheet-delivery mechanism, a breaking-roller having an accelerated movement, a folding-blade, rolls and two gages at opposite ends of the folding-blade, mechanism for raising and lowering such gages alternately, and belts for conveying the two parts of the printed sheet from the breaking-roll in opposite directions in beneath the folding-blade and against the respective gages, substantially as set forth.

7. The combination, with a printing mechanism for printing upon the opposite sides of a sheet to form two similar products, of perforating mechanism for perforating the sheet between the two products, sheet-delivering mechanism, a breaking-cylinder for separating the products at the line of perforations, a slitter for dividing the paper longitudinally, and folding mechanism for acting upon the printed sheets to bring together the parts of each product, substantially as set forth.

8. The combination, with the reciprocating bed and the oscillating impression-cylinder in a printing-press, of a sheet-delivery cylinder and ratchet-gearing acting in both directions for communicating to the delivery-cylinder an intermittent movement in one direction and in harmony with the impression-cylinder and during the oscillations in both directions, substantially as specified.

9. The combination, with the reciprocating type-bed and the oscillating impression-cylinder in a printing-press, of a sheet-receiving cylinder, ratchet connections and gearing for giving an intermittent motion in one direction to the receiving-cylinder during each oscillation of the impression-cylinder, and a brake to prevent an accelerated or continued movement of the receiving-cylinder as the oscillating cylinder stops, substantially as set forth.

10. The combination, with a reciprocating type-bed, an oscillating impression-cylinder, and a sheet-reversing mechanism adapted to print upon both sides of the sheet, of a slitter for separating the sheet longitudinally, and two folding-blades and pairs of rolls to act upon the two parts of the sheet, substantially as set forth.

11. The combination, with the impression-cylinder, reciprocating type-bed, and reversing-cylinder, of a sheet-delivery mechanism adapted to separate the sheet transversely, a folder, and conveying-belts for bringing the second sheet in beneath the folder in the opposite direction to the first sheet, substantially as set forth.

12. The impression-cylinder and reciprocating type-bed, in combination with the sheet-reversing mechanism to print two complete products on one sheet, mechanism for separating the sheet in the middle widthwise to separate one product from the other, a slitter to slit each product into two parts, blades and rollers for acting on the two parts of each product, and belts for bringing such two parts together, substantially as specified.

13. The combination, with a reciprocating type-bed and an oscillating impression-cylinder, of two sets of grippers standing in opposite directions, one for taking the sheet as fed to the press, the other for receiving the sheet as reversed, a reversing-cylinder, belts, and a V-shaped guide, adjacent to which the sheet passes in opposite directions, substantially as set forth.

Signed by me this 17th day of July, 1890.

WALTER SCOTT.

Witnesses:

GEO. T. PINCKNEY,

WILLIAM G. MOTT.